

difficult to carry out under the conditions of education in this country, our teachers could nevertheless, provided they are sufficiently well conversant with the German language, gather a large amount of useful hints, even if only from the method of treatment of the material. For use in Germany we have no doubt that the teachers will hail gladly the appearance of this volume, and the distinguished list of co-workers with Prof. Höfler is sufficient indication to stamp the volume as one of a high order.

Einführung in die Agrikulturmykologie. By Prof. Dr. A. Kossowicz. 1. Teil: Bodenbakteriologie. Pp. vii+143. (Berlin: Gebrüder Borntraeger, 1912.) Price 4 marks.

PROF. KOSSOWICZ is to be congratulated on having condensed into such a small book a review of the chief publications on soil mycology. The book partakes, in fact, more of the nature of an introduction to the literature of the subject than to the subject itself. The mere enumeration of the various workers for and against a hypothesis, without any criticism from the author, is not calculated to afford much help to a beginner. The subject-matter is divided into sections dealing with the part played by bacteria in the cycle of the elements carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus, and iron; the mycology of soil; the mycology of manure; and the influence of the manurial treatment on the micro-flora of the soil. For such a small book the bibliography is very comprehensive, constituting, as it does, about one-fourth of the total number of pages. The book is well illustrated, and as a short work of reference ought to prove of value to agricultural chemists and mycologists.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Piltdown Skull.

It had been my intention not to add anything further in print to my preliminary note (Quart. Journ. Geol. Soc., vol. lxix., 1913, p. 145) on the cranial cast obtained by Dr. Smith Woodward from his reconstruction of the Piltdown skull until I was in a position to make a full and comprehensive statement as to the precise significance of the information afforded by the cranial fragments as to the kind of brain possessed by the earliest known human inhabitant of Britain. But, although my investigations are now sufficiently advanced to permit me to undertake the writing of my report, it will be some months before it can be published; and in the meantime it is most undesirable that the present widespread misunderstandings should be allowed to breed further trouble and confusion for those who are interested in the elucidation of Mr. Charles Dawson's momentous discoveries.

Recent events have made it difficult for those who have relied wholly upon what has appeared in print to form any accurate conception of the meaning and importance of the Piltdown skull-fragments. It is quite certain that they afford the first evidence we

have obtained of a hitherto unknown group of the Hominidæ, so fundamentally distinct from all the early fossil men found in Europe as to be worthy of generic distinction—a "dawn-man" of a very primitive and generalised type. Certain features are so clearly ape-like as definitely to confirm the generally admitted kinship to the African anthropoid apes, as well as to distinguish *Eoanthropus* sharply and clearly from all other human remains. In other respects, however, there is a closer resemblance to the features of modern man than is found in the specialised group of Neanderthaloid palæolithic men. This curious association of features is not paradoxical, as some people pretend. The small and archaic brain and thick skull are undoubtedly human in character, but the mandible, in spite of the human molars it bears, is more simian than human. So far from being an impossible combination of characters, this association of human brain and simian features is precisely what I anticipated in my address to the British Association at Dundee (NATURE, September 26, 1912, p. 125), some months before I knew of the existence of the Piltdown skull, when I argued that in the evolution of man the development of the brain must have led the way. "The growth in intelligence and in the powers of discrimination no doubt led to a definite cultivation of the æsthetic sense, which, operating through sexual selection, brought about a gradual refinement of the features." Just as the young child still uses its teeth for purposes of attack, so in the dawn of human existence teeth suitable for offensive purposes were retained long after the brain had attained its distinctively human status and had made the hands even more serviceable instruments for attack.

That the ape-like conformation of the chin region signifies the inability to speak is surely a patent fallacy. Articulate speech must have come while the jaws were still simian in character; and the bony changes that produced a chin were the result mainly of that process of refinement to which I have already referred, to the reduction of the teeth, which was part of the same process, and, quite in a minor degree, to that process of growth and specialisation of the genio-glossi muscles which resulted from their use in speech.

A great source of misunderstanding will be got rid of if these obvious facts and the considerations based upon them be admitted.

In conclusion, I may answer many questioners by affirming that I still hold to every word of my preliminary note published in the Quarterly Journal of the Geological Society, as well as of the statements made in my lectures delivered before the Royal Dublin Society and the Manchester Literary and Philosophical Society last winter, and also to the facts demonstrated in my exhibit at the Royal Society's soirée in May.

G. ELLIOT SMITH.

University of Manchester, September 23.

Solar Electrical Phenomena.

In a lecture last January to the Christiania Academy, Prof. Birkeland¹ gave an interesting summary of his recent researches on solar and planetary electrical phenomena. He describes how in a study intended to elucidate the evolution of celestial bodies he examined the nature of the electric discharge taking place *in vacuo* in a large discharge vessel from a magnetisable globe serving as cathode. The experiments, which were made under widely differing conditions, were on a scale more ambitious than anything hitherto attempted. Two vessels of 300 and 1000 litres' capacity respectively were employed. In the larger of these the globe used was of 36 cm. diameter,

¹ "De l'origine des mondes," par K. Birkeland, Arch. Sci. phys. et nat. Genève. Quatrième Période, t. xxxv., Juin, 1913.

and discharges up to nearly half an ampere were obtained. Some of the published photographs are very remarkable. One of them showing the electric corona and streamers round the magnetised globe might easily be mistaken for a genuine photograph of a typical solar eclipse. Many of the phenomena of sunspots are also very strikingly imitated in the experiments.

Birkeland proceeds to discuss the cause of the general magnetic field of the sun, the fact of the existence of which has been established by Hale. He attributes it to induced currents circulating in the interior of the rotating mass, which, he argues, can only have a comparatively feeble electric conductivity.

He says (*loc. cit.* p. 540):—

"We know that electric currents circulating in large globes formed of good electric conductors are of great persistence. Lamb found that for a globe of copper as large as the earth, ten million years would elapse before the currents fell to $1/e$ of their former intensity. The induction effects produced by electric rays emanating from sunspots may therefore give rise to currents of long duration if circumstances permit. It is probable that as regards the sun, we shall be obliged to suppose a somewhat feeble conductivity of the gaseous interior, to the intent that the electric currents created and circulating within it are reduced with a fairly high rapidity and are transformed into heat."

In a recent communication to the Royal Astronomical Society,² the writer brought forward some evidence deduced from laboratory experiments, which led to a contrary conclusion, namely, that the gaseous matter composing the sun must be a highly conducting medium. The experiments of Kaye³ and the writer showed that carbon and a number of metals emit on heating ionisation currents of a relatively very high order of magnitude, and this in absence of any external applied potential and at atmospheric pressure. The currents are almost certainly carried by swarms of negatively charged particles of relatively considerable mass, the emissivity of the emitting surface increasing very rapidly with increase of temperature.

In the interior of a carbon-tube resistance-furnace heated by alternating current, the apparent gaseous resistance of the order of megohms at 1400° C. fell at the highest attainable temperature to a small fraction of an ohm, due to the emission from carbon alone. In one series of experiments where temperature measurements were made, the conductivity increased exponentially nearly two hundred-fold for each rise of 1000° C. Impurities such as iron and silicon, which are generally present in ordinary samples of carbon, may further increase the conductivity four or five fold during the first heating of a new furnace. Though influenced somewhat by the surrounding gas, the emissivity appears to be invariably present in neutral or reducing media. The experiments of King, briefly referred to by Hale in his paper in the current number of *The Astrophysical Journal*, show that though the emissivity of carbon falls with increase of pressure, it is still apparent at 20 atmospheres.

Seeing that the temperature of the sun is probably between 5600° and 6000° abs. and that of those elements shown to possess an appreciable electric emissivity, carbon, and iron at any rate are present in the solar atmosphere in considerable quantity, it is difficult to avoid the conclusion that the degree of ionisation, and consequently of electric conductivity,

must be very high; probably at least as good as that of the globe of copper considered in Lamb's computation.

The bearing of these conclusions on Birkeland's solar theory seemed worthy of some consideration.

J. A. HARKER.

Teddington, September 16.

A New Aquatic Annelid.

ABOUT the middle of September I received from Dr. H. F. Parsons, of Croydon, a fresh-water Annelid which had been found in the water supply of Ringwood, Hants, and sent to the Local Government Board for identification. It proved to be an immature but very beautiful specimen of *Rhynchelmis limosella*, Hoffm., a member of the Lumbriculidæ. It is of peculiar interest, inasmuch as it confirms a suspicion expressed by Beddard in 1895. He remarks ("Monograph of the Order Oligochaeta," p. 215) that "the genus *Rhynchelmis* is, so far as our present knowledge goes, confined to the fresh waters of Europe. . . . I have seen a specimen from some part of England, but cannot give any details. I believe this specimen to be in the Oxford Museum. There is every probability that it is a native of this country."

I have collected annelids in almost every part of the British Isles, but hitherto have never had the good fortune to come across the species here named. It is, therefore, very gratifying to be able to record it as a new addition to our Annelid fauna.

HILDERIC FRIEND.

Pocklington, York, September 20.

MODERN ELECTROMETERS.

RECENT research on the electron and radio-activity has necessitated so many refined electrostatic measurements that much attention has been directed to the design of electrometers, and several different instruments distinguished by their sensitiveness and convenience in working have been devised. Two types have served as the starting-points for modern improvements, the first being the gold-leaf electroscope, and the second the quadrant electrometer of Lord Kelvin; great progress has been made by bettering the insulation, the sensitiveness, and the accuracy and ease of observation, and further by important modifications of design. Polished amber or ambroid, a substance made from compressed fragments of amber, is now generally used as insulating substance, and for the first type of instrument the deflection is now measured with a reading microscope; for the second the mirror and scale is employed.

The gold-leaf instrument is used in many forms. In a modification by Exner a leaf is fastened on either side of a narrow, vertical, insulated metal plate, while opposite each leaf is a metal plate the distance of which from the central plate can be adjusted, thus controlling the sensitiveness; for potentials of some hundred volts this is a convenient form. For higher potentials of thousands of volts Braun's pattern, with a light rigid needle pivoted a short distance above its centre of mass, is much used. For very sensitive measurements C.T.R. Wilson has recently modified the gold-leaf electroscope in his so-called "tilted electrometer." In this instrument a single hanging gold leaf is attracted out of the vertical by an inclined insu-

² Harker, "On the Origin of Solar Electricity." Monthly Notices of the Royal Astron. Soc., June, 1913.

³ Harker and Kaye "On the Emission of Electricity from Carbon at high Temperatures." Proc. Roy. Soc. A. vol. lxxxvi, 1912, pp. 379 to 396.

"On the Electric Emissivity and Disintegration of Hot Metals." Proc. Roy. Soc. A. vol. lxxxviii, 1912, pp. 522 to 538.